LEUKOPENIA. IT'S RELATION TO ORCHITIS. CASE REPORT.

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This communication suggests that hematogenous infection of the testes is practically always due to organisms which tend to produce a relative or an absolute reduction in the number of polynuclear leukocytes. It considers: (a) the infectious etiology of orchitis, (b) the leukocyte pictures present in these infections, and, (c) the relation between the leukocyte picture and the liability to orchitis.

An organism may reach the testes by extension or through the blood stream. Gonorrheal orchitis results from the former method. This paper will consider the hematogenous infections.

ETIOLOGY OF ORCHITIS.

The most common and most widely recognized infectious cause of orchitis is mumps. Ballenger [1] and Ruhräh [2] call it the chief cause, numerous others [3] mention it, and Dukes,[4] Higgins [5] and others [6] have reported specific cases. The orchitis, although it usually follows the parotitis, may precede [7] or replace [8] it.

Orchitis may complicate typhoid.[9] It is relatively rare, McCrae [10] finding it in only 0.27% of his cases. Beardsley [11] reports four cases and reviews the literature to 1908, finding a total of 102 cases reported. It tends to come late in the disease [10] or in convalescence [12].

Craig [13] finds orchitis a very common complication of malaria but usually obtains a gonorrheal history and doubts whether true malarial orchitis occurs. Thayer [14] admits its occurrence but thinks it the result of mixed infection. It is reported by many [15], however, as a complication peculiar to malaria.

It is well established that orchitis may complicate smallpox.[16] Rogers [17] found it in 48 of 55 smallpox cadavers. Spermatogenesis stops, degenerations similar to those of typhoid take place and pustules may develop.[18]

Walker [3] and Osler [19] speak of orchitis as complicating influenza. It has been observed infrequently in scarlet fever.[20] It is a rare complication of tonsillar fever.[21]

Virulent pneumonias have been accompanied by orchitis.[22] This complication is exceedingly rare, Musser and Norris [23] finding in only 2 cases out of 930. A case reported by Prioleau was fatal.

Orchitis has been observed in pyemia.[24] Quenu [17] speaks of the tonsils, parotid and testes acting as depurative organs in overwhelming infections. Burnham [25] reports a case of Villanova's suffering from Malta fever in which an orchitis was an early feature. Boral [26] finds orchitis one of the complications of typhus in the present war.

An orchitis may appear and disappear quickly in filariasis according to Stiles.[27] Manson thinks that some cases of "malarial orchitis" are really filarial infection.

Chronic orchitis may be due to syphilis, tuberculosis or leprosy. The chronic form is seen most strikingly in syphilis [28] which is a common cause.[29]

Tuberculosis is a fairly frequent etiological factor.[28] The testes are usually attacked secondarily [30] but may be attacked primarily.[31] Adami [28] makes the point that while in adults the epididymis is usually attacked first, in children before puberty the reverse is true.

Lepra may occur in the testes in the form of a granuloma leading to necrosis.[28] Orchitis was rarely a complication at Molokai.[32]

LEUKOCYTE PICTURES.

The blood pictures in the infections just listed as causative of orchitis will now be considered showing the tendency toward reduction in the number of granular leukocytes.

Leukocytosis is absent in mumps [33] and there may be a relative mononucleosis.[34]

It is well established that a leukocytosis is wanting in typhoid [35] and that in nearly all cases there is a leukopenia.[36] Although the latter has been called a late feature by some observers,[37] others [38] find it constant, Hultgen [39] saying it is present early in marked degree. Some [40] claim it is a more constant early sign than the Widal test. A relative lymphocytosis is also characteristic of typhoid,[41] due to the marked decrease in the number of polymorphonuclear cells.

Malaria gives no leukocytosis,[42] and leukopenia is practically constant.[43] While Stitt [37] finds the leukopenia characteristic of the apyrexial period and Billings of the pyrexial, Türck and others find this feature in both. The granular cells suffer most and there appears therefore a relative increase in the number of hyaline cells. There is usually an increase in the number of large mononuclear cells,[44] and they may reach as high as 35%.

There may be a polynuclear leukocytosis in smallpox, but Councilman [45] finds the number of leukocytes normal during the febrile period and that the slight leukocytosis at postulation is due to lymphocytes. Buchanan [46] says there is a diminution in the percentage of polymorphonuclear cells and a mononuclear increase, and that in the virulent and hemorrhagic cases there may be a leukopenia. Mild cases have been reported with normal or subnormal counts,[47] and many observers reporting a leukocytosis find the new cells mainly lymphocytes.[48]

There is a leukopenia [49] or absence of leukocytosis [50] in uncomplicated influenza. No mention was found of an increase in lymphocytes. There is, however, a tendency toward lymphocyte increase in cases of granular cell decrease.[51]

Malta fever gives no leukocytosis [52] and may give a leukopenia.[53]

Leukocytosis has been variously reported in typhus fever, but Buchanan [46] quotes certain observers as finding no leukocytosis and sometimes a leukopenia. Ewing [50] found no increase in granular cells in 4 cases. Love [54] finds an increase in large mononuclear cells in non-fatal cases, and Gulland and Goodal [55] state that while polynuclear leukocytosis is the rule, in the late stages the lymphocytes may reach 50%.

The eosinophilia of filariasis is well known. Stiles [27] says a lymphocytic increase of 24% to 40% is characteristic.

No record of a leukocytosis in uncomplicated syphilis was found. Stitt [37] says it does not occur. A relative lymphocytosis is more or less constant in the various forms of congenital and acquired syphilis.[56]

Leukopenia [57] or an absence of leukocytosis [51] is the rule in tuberculosis. Cabot [33] excepts the meningeal form and Wood [33] the meningeal and serosal forms. Emerson [36] and Stitt [37] say leukopenia is especially characteristic of acute miliary tuberculosis. A relative lymphocytosis tends to be a feature, especially in acute cases [58] in children [51] and in cases involving the lymphatic apparatus.[59]

Most observers [60] say a leukocytosis is absent in leprosy. Currie [32] says at Molokai there was generally a leukocytosis but a greater increase in the lymphocytes. Gulland and Goodal [33] also report the relative increase in lymphocytes.

Leukocytosis is the rule in scarlet fever which was mentioned above as an infrequent cause of orchitis and so it is notable that in certain forms of scarlet fever there may be observed the decrease in the number of granular cells or the increase in hyaline ones. The leukocytosis may not arrive until late,[61] or if the disease is quite virulent there may be a leukopenia.[62] With severe infection and low resistance the leukopenia which precedes leukocytosis may persist.[51] Although not the rule, a lymphocytosis may occur in scarlet,[51] especially late.[63] Türck finds, on the fifth day, a drop in the number of polynuclear cells and a rapid increase in lymphocytes and eosinophils.

Similarly, tonsillitis usually gives a leukocytosis of the polynuclear variety, but Adami,[64] Cabot [65] and Emerson [36] call attention to the greater increase in lymphocytes when the cervical glands are involved. It is suggested by the author that it is in just such cases that the testes would be most vulnerable. Stitt [37] says enlarged tonsils may give a white count of 10,000 to 15,000, 50% of the cells being lymphocytes.

Most pneumonias are accompanied by a polynuclear leukocytosis, but it may be absent in virulent cases [62] and a fatal course may be marked by a leukopenia.[66] There may be a lymphocytosis during prolonged lysis.[63]

Leukocytosis may be absent in very mild [40] and very severe [67] septicemia, or there may be a leukopenia.[68] It is in the virulent types that orchitis occurs.

The following case shows further the relation between leukocyte picture and testicular affection:

History. A. A., age 30, male. Enters San Francisco Hospital in June, 1915. Complaint, gastro-intestinal upsets. Has had measles, mumps, chicken pox, typhoid and malaria. Had a hard genital sore 10 years ago and three attacks of gonorrheal urethritis. Has used whisky to excess. For about seven years has had attacks of nausea and vomiting, sometimes of large amount of fresh blood. Noted a slightly darkened stool on occasions. Never epigastric pain or tenderness, nor symptoms of hyperchlorhydria, nor definite relation between vomiting and taking of food. Has lost 10 pounds in the last year. Is a sexual pervert.

Physical examination. The liver extends from the 4th interspace above, to 8 cm. below the costal margin in the mid-clavicular line. Spleen felt 2 cm. below costal margin. There is a small amount of fluid in the abdominal cavity. Each testis is about half the normal size and quite hard.

Blood examinations. The red cell count ranged from 3,000,000 to 4,800,000 per cm. during two months' stay in the hospital. There were no remarkable findings in smears aside from a moderate central pallor of the red cells. The white count averaged 6,000 per ccm. and was as low as 5,000 and 4,500 on occasions. The differential count was not remarkable.

Diagnosis: Alcoholic fatty cirrhosis.

The testes are the seat of atrophy or of hypoplasia, and there is a definite increase in fibrous tissue. There is no history of a definite orchitis although there is abundant etiology for the latter. Six of the seven infections in the case give the blood pictures under consideration and during a stay of two months in the hospital leukopenia was constant.

Consult table for résumé.

	Total Whites	Granulars Rel.	Granulars Abs.	Hyalines Rel.	Hyalines Abs.	G.—H.	Orchitis
Mumps	=	—	—	+		+	+
Typhoid ...	—	—	—	+		+	+
Malaria ...	—	—	—	+		+	+
Influenza ..	=		—			+	+
Malta fever	—		—			+	+
Typhus	+—	—	—	+	+	+	+
Filariasis ..	+—	—		+	+	+	+
Syphilis ...	=	—	—	+		+	+
Tuberculosis	=—	—	—	+		+	+
Leprosy ...	—	—	—	+	+	+	
Regular..	+	—		+	+	+	+
Smallpox...							
Virulent..	—	—	—	+	+	+	
Regular..	+	+	+	—	—	—	+
Scarlet.....							
Virulent..	—	—	—	+	+	+	
Regular..	+	+	+	—	—	—	+
Tonsillitis with Granular Inv..	+	—		+	+	+	
Regular..	+	+	+	—	—	—	+
Pneumonia..							
Virulent..	—	—	—	+		+	
Regular..	+	+	+	—	—	—	+
Septicemia..							
Virulent..	—	—	—	+	+	+	+
The diathesis	—	—	—	+		+	+

Key to chart { = no change. — decrease in number. + increase in number or present.

SUMMARY.

1. Hematogenous infection of the testes may occur in mumps, typhoid, malaria, influenza, malta fever, typhus, filariasis, syphilis, tuberculosis, leprosy and smallpox; and less frequently in scarlet fever, tonsillitis, pneumonia and septicemia.

2. A reduction absolute or relative, in the number of granular leukocytes, is characteristic of the above infections excepting scarlet fever, tonsillitis, pneumonia and septicemia.

3. A reduction absolute or relative, in the number of granular leukocytes does occur under certain conditions in scarlet fever, tonsillitis, pneumonia and septicemia.

4. Even in the absence of a history of orchitis there may be a relation between testicular affection and leukopenia in the case reported.

After a careful consideration of the etiology of orchitis; a study of the leukocyte pictures in the

infections reaching the testes through the blood stream; and the observance of testicular affection in a case with a history of infections belonging almost exclusively to the group under consideration, and at the same time exhibiting a leukopenia —the suggestion is offered that there is a definite relation between testicular affection on the one hand and a disturbance in the normal relation between the number of granular to the number of hyaline leukocytes, i. e. a tendency toward decrease in the number of granular cells and increase in the number of hyaline ones.

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CLINICAL RECORDS.*

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IV. "THE WARD REFERENCE BOOK."

The duty of hospitals to try out the newer suggestions in diagnostic and therapeutic procedures necessitates their doing many things which are not described in text-books; and it is customary for the workers to keep memoranda of such procedures for handy reference. What often happens, however, is that interns keep notebooks or card systems while they are on service and carry them away or lose them when they leave, so that the routine work of the wards and laboratories is subject to frequent alterations. While changes in technic are often desirable, they should of course be dictated by choice rather than chance, and the

* Fourth article describing the clinical record system in the University of California Hospital. An article by Dr. J. L. Whitney and one by the writer on related subjects appeared in the Boston Medical and Surgical Journal of November 18, 1915. Reprints of the series when complete, together with record forms, etc., will be sent on request.